2017

The Five Hundred and Fortieth Report of the Curricular Affairs Committee: Creation of Data Science Program-BA, BS and Minor.

University of Rhode Island Faculty Senate

THE
UNIVERSITY
OF RHODE ISLAND
FACULTY SENATE OFFICE
Green Hall, 35 Campus Avenue, Kingston, RI 02881 USA p: 401.874.2616

THINK BIG WE DO

Serial Number #16-17-28C

TO: President David Dooley
FROM: W. Michael Sullivan, Chairperson of the Faculty Senate

1. The attached BILL titled, The Five Hundred and Fortieth Report of the Curricular Affairs Committee: Creation of Data Science Program-BA, BS and Minor, is forwarded for your consideration.

2. This BILL was adopted by vote of the Faculty Senate on April 20, 2017.

3. After considering this bill, will you please indicate your approval or disapproval. Return the original, completing the appropriate endorsement below.

4. In accordance with Section 10, paragraph 4 of the Senate's By-Laws, this bill will become effective May 11, 2017 three weeks after Senate approval, unless: (1) specific dates for implementation are written into the bill; (2) you return it disapproved; or (3) the University Faculty petitions for a referendum.

W. Michael Sullivan
Chairperson of the Faculty Senate

April 20, 2017

ENDORSEMENT

TO: Chairperson of the Faculty Senate

FROM: President of the University

a. Approved ____.

b. Approved subject to Notice of the Council on Postsecondary Education ✓.

Noticed - 6/21/17

c. Disapproved ____.

Signature of the President

5.10.17
(date)

THE UNIVERSITY OF RHODE ISLAND
1892–2017

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OFFICE OF THE PRESIDENT
Green Hall, 35 Campus Avenue, Kingston, RI 02881 USA p: 401.874.2444 f: 401.874.7149 uri.edu/president

MEMORANDUM

TO: Dr. Brenda Dann-Messier, Commissioner of Postsecondary Education
RI Office of the Postsecondary Commissioner

FROM: David M. Dooley
President

DATE: May 10, 2017

SUBJECT: University of Rhode Academic Program Changes

Enclosed you will find the following academic changes approved by the Faculty Senate on April 20, and by me on May 9, 2017.

16-17-27C - Graduate Certificate in Dyslexia
16-17-28C - Creation of Data Science Program-BA, BS and Minor
16-17-28D - Creation of Creative Writing Option for the English major
16-17-28E - Creation of a Business of Digital Media (BDM) Minor
16-17-28F - Creation of a Minor in Innovation Management and Entrepreneurship

I look forward to a positive review and positive actions on the above item. Donald DeHayes, Provost and Vice President for Academic Affairs, will serve as the University's contact. Please feel free to directly contact the Office of the Provost if you have any questions.

enclosures

c: Donald H. DeHayes, Provost and Vice President for Academic Affairs
Laura Beauvais, Vice Provost for Faculty Affairs and Global Initiatives
Dean Libutti, Vice Provost for Enrollment Management
Nancy Neff, Faculty Senate Coordinator

THE
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FACULTY SENATE OFFICE

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UNIVERSITY OF RHODE ISLAND FACULTY SENATE
April 20, 2017

Faculty Senate Curricular Affairs Committee
Five Hundred and Fortieth Report

At the March 27, 2017 meeting of the Curricular Affairs Committee and by electronic communication, the following matters were considered and are now presented to the Faculty Senate.

SECTION II
Curricular Matters Which Require Confirmation by the Faculty Senate

PROGRAM CHANGES

COLLEGE OF ARTS AND SCIENCES:

Creation of a BA, BS, and Minor in Data Science Program (DSP): (See Appendix E)
Data Science is a discipline that deals with all aspects of data, including procurement, archival, cleaning, analysis, and communication/visualization. It is a newly emerging discipline that is now being defined internationally. It is highly interdisciplinary in nature. Typical partners are from mathematics, statistics, business, and the computational and information sciences. Students preparing in data science are recommended to take coursework in math, statistics, and computing. Preparation in communication skills, curiosity and teamwork are also highly important, as are lifelong learning skills. [http://www.bls.gov/careeroutlook/2013/fall/art01.pdf]
NSF funded meetings on the nature of data science programs were consulted to develop this program. Reports from national meetings, existing programs, and information from industry about workforce needs have guided this proposal. We have also tapped into the talent that we have present in the big data collaborative and cluster hire. This takes advantage of talent and needs in six colleges at URI (A&S, BUS, ENG, GSO, Health, Pharmacy). This program also includes general education classes focused on data.

THE
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Appendix E

Revised 8/2016

Full Proposal Form
For All Programs including Certificates
Requiring New Funding or Resources

A Proposal for: BA, BS, and Minor in Data Science

Date: February 15, 2017

A. PROGRAM INFORMATION

A1. Name of institution University of Rhode Island

A2. Name of department, division, school or college
Department – Computer Science & Statistics
College – Arts and Sciences
This is coordinated by a committee from the interdisciplinary Big Data Collaborative with Arts & Sciences managing the program with partners from Business, CELS, GSO, Pharmacy, and the Health College who will serve on the program advisory board/committee.

A3. Title of proposed program and Classification of Instructional Programs (CIP) code
Program title: Data Science
Classification code (CIP): 30.999 (Multi/Interdisciplinary Studies/Other)

A4. Intended initiation date of program change. Include anticipated date for granting first degrees or certificates, if appropriate.
Initiation date: Fall 2017
First degree date: May 2021 for majors. Could be as early as May 2019 for the minor.

A5. Intended location of the program
University of Rhode Island

A6. Description of institutional review and approval process

	Approval Date
Department:	
Big Data Collaborative	2/15/17
Colleges : Arts & Science	3/10/17
CAC	
Faculty Senate	
President of the University	

A7. Summary description of proposed program (not to exceed 2 pages)
Data Science is a discipline that deals with all aspects of data, including procurement, archival, cleaning, analysis, and communication/visualization. It is a newly emerging discipline that is now being defined internationally. It is highly interdisciplinary in nature. Typical partners are from mathematics, statistics, business, and the computational and information sciences. Students preparing in data science are recommended to take coursework in math, statistics, and computing.

Preparation in communication skills, curiosity and teamwork are also highly important, as are lifelong learning skills. [http://www.bls.gov/careeroutlook/2013/fall/art01.pdf]

NSF funded meetings on the nature of data science programs were consulted to develop this program. Reports from national meetings, existing programs, and information from industry about workforce needs have guided this proposal. We have also tapped into the talent that we have present in the big data collaborative and cluster hire. This takes advantage of talent and needs in six colleges at URI (A&S, BUS, ENG, GSO, Health, Pharmacy). This program also includes general education classes focused on data.

The BA contains a core of computational, statistical, and ethics classes, with electives in analytics, and design. The BS will have a similar core, but with more rigorous statistics and computer science classes, and more courses, required. Both are aimed at arming students with critical problem solving, ethical, and communication skills and require a capstone course, internship, or research project. There is flexibility in the structure of the program that will permit emphasis in various areas of a student's interest.

This effort responds to industry's assertions that teams of differentially trained data experts who also possess the essential skills of teamwork, communication and collaboration are most needed to meet the challenges of big data. The BS will permit students to become experts in one or more aspects of data in a single or number of domains of their choice. Important aspects include collection, archival, cleaning, analysis, and communication/visualization. Every student will have some exposure to most of these topics. Data analysis domains into which a BS student may wish to gain depth include computational statistics, machine learning, (computational or statistical), mathematics, and/or computer engineering (signal processing). BA or BS students might choose to develop expertise in GIS, predictive analytics, visualization, or security and safety (by taking cybersecurity and digital forensics classes or minors, for example). Students minoring in data science may wish to complement the core data science skills with an integrative project in the history of data, the ethics of data, the social impact of data, the politics of data, etc.

Although these programs will draw heavily from computer science, mathematics, and statistics offerings, many of the courses will be revised to include the important learning goals specific to data science. Some courses listed in the BA degree will be tailored for data science students, rather than exclusively for those who are aiming to major in computing, science, or mathematics/statistics. In the case of the BS, new courses have been created for the major that will enhance the related STEM degrees. For example, we are enhancing an existing database class to address the use and tailoring of databases for both relational and no-SQL environments. This is complementary to the database course for computer science majors where students learn to build database management systems. The database class for data science majors will be taught by Business professor and will be more suitable for students from multiple backgrounds and perspectives. Visualization and communication techniques and tools are important aspects of the new Statistics and Computer Science classes, and are essential skills for data science majors.

A8. Signature of the President

David M. Dooley

A9. Person to contact during the proposal review

Name: Joan Peckham
Title: Chair, Computer Science & Statistics, co-Coordinator of Big Data Initiative
Phone: 401-874-4174
Email: joan@cs.uri.edu

A10. List and attach any signed agreements for any cooperative arrangements made with other institutions/agencies or private companies in support of the program.

N/A

B. RATIONALE: There should be a demonstrable need for the program.

B1. State the program objectives.

- **Train a new generation of students who will need to function as well informed citizens in this new digital age of data, where everyone, regardless area of expertise and training will need to make sense of data.**
- **Educate a cohort of data science professionals who are able to join interdisciplinary teams of professionals to solve problems, communicate the results, and understand the legal and ethical implications of their work with data.**
- **Provide students with strong technical and analytical skills for all aspects of data.**
- **Provide students with strong problem solving skills for all aspects of data.**
- **Provide students with essential communication and teamwork around data.**
- **Provide students with the skills manage all aspects of data, including collection, organization, cleaning, access, analysis and communication/visualization.**

B2. Explain and quantify the needs addressed by this program, and present evidence that the program fulfills these needs.

a. What is the economic need and workforce data related to the program?

Code.org reports that there are thousands of unfilled software openings across the country and approximately 1700 in Rhode Island alone. Burning-Glass.com reports that openings for data or analyst specialists are not far behind as the second most needed skills, at 1100 in Rhode Island. Both are projected to be among the fastest growing needs. Data science cuts across all disciplines and enterprises. While biology and astronomy were among the first disciplines flooded with data needs, today all businesses, governments, and enterprises call for data scientists and require everyone to have at least rudimentary understanding of data. Consider for example, the data collected around the current election cycle and the need for voters, election committees, and news reporters to understand election results and voting polls. Similarly, educational institutions, federal agencies, medical communities, and legislators are calling for evidence-based policies and strategic plans. Data science has arisen to meet these modern challenges.

b. Provide information on jobs available as a result of successfully completing the certificate or degree: job titles, job outlook/growth, and salaries.

Job Titles: Data Scientist, Data Analyst, Advanced Analytics, Big Data Analytics, Statistical Modeling & Analytics. See http://www.datasciencecentral.com/profiles/blogs/job-titles-for-data-scientists for more.

Salaries: Nationally average salaries ranging from $100,000 to $ 130,000 – O'Reilly Survey in 2013 - http://www.forbes.com/sites/rawnshah/2014/01/16/revealing-data-sciences-job-potential/#3cb60e862c87

Searching for job titles with "analysts" in the title at bis.gov/ooh yields median incomes such as the following, for example:
Information Security Analysts - $90,120
Financial Analyst - $80,310
Database Administrators - $81,710

Students majoring a STEM domain with a double major or minor in data science would likely improve their opportunities for employment. However, it is difficult to search for data on the opportunities for data scientists because it is a new domain that is not used for classification by the Bureau of Labor Statistics.

Most companies are now training their employees with data analytics skills due to a tight supply: http://www.forbes.com/sites/gilpress/2015/04/30/the-supply-and-demand-of-data-scientists-what-the-surveys-say/#6a944ce4205e. For most jobs, at least a bachelor's degree is necessary, with many of the top jobs requiring graduate degrees. Most companies cite the need for all of their employees to have strong analytical skills, which supports students who might pursue double majors or minors to complement their degrees in another domain.

B3. If an external advisory or steering committee was used to develop the program, identify committee members and their affiliations and describe the committee's role.

The following committee members have met, conducted research on other similar programs, provided input into and approved the proposed curriculum. They have also helped to identify courses and topics that are already present at URI and to coordinate with the departments and instructors of our interest in including their courses in this program. In some cases, they have created new courses for the program. They have provided observations on how courses for this major might also support URI's new general education program. If the program is approved, members of this committee will be asked to continue to serve as coordinators and advisors in the new program or help us to secure viable replacements.

Wayne Velicer Professor, Psychology and Cancer Prevention Center, Arts & Sciences
Yinjiao Ye, Associate Professor, Communication Studies, Arts & Sciences
Julia Lovett, Assistant Professor Librarian, URI Library
Lenny Moise, Associate Professor Research, Institute for Immunology and Informatics, CELS
Lutz Hamel, Associate Professor, Computer Science and Statistics, Arts & Sciences
Steffen Ventz, Assistant Professor, Computer Science and Statistics, Arts & Sciences
Stephen Kogut , Professor Pharmacy Practice, Pharmacy
Patricia Burbank, Professor, Nursing
Lubos Thoma, Associate Professor, Mathematics, Arts & Sciences
Valerie Karno , Associate Professor, English and Graduate School of Library Science
Susanne Mendon-Duer, Associate Professor, GSO
Atlas Stephen , Assistant Professor, Business
Annu Matthew, Professor, Art and Center for the Humanities
SK Shin, Associate Professor, Business

Alan Verskin, Assistant Professor, History, Arts and Sciences
Soni Pradhanang, Assistant Professor, Geology, CELS

C. INSTITUTIONAL ROLE: The program should be clearly related to the published role and mission of the institution and be compatible with other programs and activities of the institution.

C1. Explain how the program is consistent with the published role and mission of the institution and how it is related to the institution's academic planning.

Goal 2, Strategy 5 of the URI Academic Plan for 2016-2025 outlines the plans for high-performance research and education initiatives, including Item 4. "Create undergraduate and graduate courses, certificates, programs and minors in big data, data science and/or data analytics … "

C2. Explain the relationship of the program to other programs offered by the institution.

As an interdisciplinary domain, data science taps into several existing programs, including Business, Computer Science, Environmental Science (GIS), and Statistics. The machine learning group in the Computer Science and Statistics department has offered existing and has created new applied classes to support this proposed major. The Business school has updated their applied database class and CSC has created a new predictive analytics classes. The GIS instructors from CELS have offered their classes as electives for the major. GSO has offered their upper level classes in a newly proposed certificate in oceanography data as domain classes for the new data science major (their classes are now being defined).

D. INTER-INSTITUTIONAL CONSIDERATIONS: The program should be consistent with all policies of the Council on Postsecondary Education pertaining to the coordination and collaboration between public institutions of higher education.

D1. List similar programs offered in the state and region, and compare the objectives of similar programs. If similar programs exist, how is this program different or why is duplication necessary?

Brown has created a new graduate data science program. Bryant College has a data analytics program that is tailored more to business applications. Ours will permit multiple pathways in other domains … for example computer science, statistics, and business. We have attended two national meetings about the emergence of data science programs, and talked to other institutions extensively. It appears that the workforce need in this domain signals the importance of availability of these programs in multiple institutions without encroaching upon enrollments. Most programs that we have surveyed are interdisciplinary in nature, but we believe that ours is unique in that it has arisen from the big data cluster hire and collaborative on campus that has a stronger interdisciplinary component than in many other places. Our attention to "no-boundary thinking and research" helps us to achieve this. These undergraduate programs are anchored in the no-boundary research that our scholars hope to achieve. Problems of our era do not fall neatly into

disciplinary silos. So scholar educators at our research institution are learning to work together to work in no-boundary fashion to make sense of data and use these results to inform and support problem solving and decision making in multiple domains.

D2. Estimate the projected impact of program on other public higher education institutions in Rhode Island (e.g. loss of students or revenues), provide a rationale for the assumptions made in the projections, and indicate the manner in which the other public institutions were consulted in developing the projections. Have you communicated with other institutions about the development of this program and have any concerns been raised related to role, scope, and mission or duplication?

To our knowledge there is not a similar program at RIC or CCRI. We have told colleagues at both institutions about this program. We do not expect any impact on their programs. We are all experiencing growth in related computer science and computer studies programs, computer engineering programs, and statistics classes. The new program will likely provide a modest increase in the number of students served by these departments. However, it might also relieve some pressures by providing another viable path to the workforce for students who are looking for degrees that provide high probability of employability, but are not well suited or as interested in computer science, statistics or computer engineering.

D3. Using the format prescribed by the Council on Postsecondary Education, describe provisions for transfer students (into or out of the program) at other Rhode Island public institutions of higher education. Describe any transfer agreements with independent institutions. The institution must also submit either a Joint Admissions Agreement transition plan or the reason(s) the new program is not transferable (see *Procedure for Strengthening the Articulation/Transfer Component of the Review Process for New Programs*).

While most other RI state institutions do not now have data science programs, many of the core and additional math, statistics, writing, and computing classes do have articulated transfers in both directions (CSC 106, CSC 211, STA 308, MTH 215, MTH 141, WRT 104, for example).

There are a few other data analytics program in the Boston area universities, and we expect more to be developed. We will consider course transfer on a case-by-case basis.

D4. Describe any cooperative arrangements or affiliations with other institutions in establishing this program. (Signed copies of any agreements pertaining to use of faculty, library, equipment, and facilities should be attached.)

a. How does this program align to academic programs at other institutions?

b. Are recipients of this credential accepted into programs at the next degree level without issue? N/A

c. How does this program of study interface with degree programs at the level below them? N/A

D5. If external affiliations are required, identify providing agencies (Indicate the status of any arrangements made and append letters of agreement, if appropriate.)
N/A

D6. Indicate whether the program will be available to students under the New England Board of Higher Education's (NEBHE) Regional Student Program (RSP).

Should the program be approved, Vice Provost Dean Libutti has agreed to work with us to make it available through the NEBHE RSP if at that time few institutions have such a program available to their students. Here is VP Libutti's e-mail to us signaling this support:

From: Dean Libutti <dean@uri.edu>
Subject: Re: Question about availability of Data Science program for NEBHE RSP.
Date: November 1, 2016 at 11:11:43 AM EDT
To: Joan Peckham <joan@cs.uri.edu>

Joan - to help bring in students - I can work with you to make this a yes. I imagine not a lot of NE States have a program like this - thus yes, let's say we will submit it for NEBHE. Each State in NE decides - so we can move it forward.

Dean

E. PROGRAM: The program should meet a recognized educational need and be delivered in an appropriate mode.

E1. Prepare a typical curriculum display for one program cycle for each sub-major, specialty or option, including the following information: Free elective credits are given below in d. Please see accompanying documents for the rest.

a. Name of courses, departments, and catalog numbers and brief descriptions for new courses, preferably as these will appear in the catalog.
Please see the following documents Appendix A
- **E1 Data Science BA**
- **E1 Data Science BS**
- **DSP Minor**
- **E1-DSP_BS-sample-schedule**
- **E1-DSP_BA-sample-schedule**
- **Course Descriptions**
- **List Of Course Prerequisites**
- **Letters of support from participating Departments**

b. Are there specializations and/or tracks/options/sub-plans/concentrations? If so, describe required courses in area of specialization or tracks/options/sub-plans/concentrations.

c. Course distribution requirements, if any, within program.

d. Total number of free electives available after specialization requirements are satisfied and after gen eds are satisfied.
BA – At least 40
BS – At least 20

e. **Total number of credits required for completion of program or for graduation. Present evidence that the program is of appropriate length as illustrated by conformity with appropriate accrediting agency standards, applicable industry standards, or other credible measure, and comparability of lengths with similar programs in the state or region.**

120 for both BA and BS

f. **Identify any courses that will be delivered or received by way of distance learning (refer to *Policy on Distance Learning, Council on Postsecondary Education, State of Rhode Island and Providence Plantations*). NONE**

g. **Is the program content guided by program-specific accreditation standards or other outside guidance? NO**

As we have already, we have and will continue to attend national meetings with other institutions that have already created, or are planning, data science programs to assure that we are in alignment with emerging national models. If academic or industrial standards or curriculum guidelines emerge, we will align with them.

E2. Describe certification/licensing requirements, if any, for program graduates and the degree to which completion of the required course work meets said requirements. Indicate the agencies and timetables for graduates to meet those requirements.

E3. Demonstrate that student learning is assessed based on clear statements of learning outcomes and expectations and provide an assessment plan.

Please see Assessment Plan developed with SLOAA (Student Learning, Outcomes, Assessment, and Accreditation) – Appendix B

a. **Include the learning goals (what students are expected to gain, achieve, know, or demonstrate by completion of the program) requirements for each program.**

b. **Demonstrate that student learning is assessed based on clear statements of learning outcomes and expectations.**

c. **Provide an assessment plan detailing what a student should know and be able to do at the end of the program and how the skills and knowledge will be assessed. Consult with the Office of Student Learning, Outcomes Assessment, and Accreditation (SLOAA) to prepare a Learning Outcomes Assessment Plan for student learning assessment. Following consultation, submit a final draft of the plan to the Chair of the Learning Outcomes Oversight Committee (LOOC) for approval.**

F. FACULTY AND STAFF: The faculty and support staff for the program should be sufficient in number and demonstrate the knowledge, skills, and other attributes necessary to the success of the program.

F1. Describe the faculty who will be assigned to the program. Indicate total full-time equivalent (FTE) positions required for the program, the proportion of program faculty who will be in tenure-track positions, and whether faculty positions will be

new positions or reassignment of existing positions. What are the minimal degree level and academic/technical field requirements and certifications required for teaching in this program?

Most of the faculty teaching and advising in this program will be in tenure track or lecturer positions in the Computer Science, Statistics, Business, and Mathematics departments. Faculty from other colleges participating in the Big Data initiative will also teach upper level classes. On occasion, part-time faculty may teach lower level classes. The budget form and budget justification lay out expected additional new faculty that will be requested through the annual position request process in place at URI. We have just hired 8 new big data scholars across six colleges. They will participate in this program. We have included statements from departments indicating that there will be ample sections/seats in their classes.

F2. List anticipated support staff, the percent of their time to be spent in the program, and whether these are reassignments or new positions. Indicate total full-time equivalent (FTE) positions required for the program.

Please see the budget form and budget justification.

F3. Summarize the annual costs for faculty and support staff by indicating salaries and fringe benefits (adjusted for the proportion of time devoted to the program). Distinguish between existing resources and new resources. Specify in the narrative if resources are to be provided by more than one department. (Include the salary and benefits information on the budget form (select *Academic Program Change Form* and see also *Budget Form Instructions*).

G. STUDENTS: The program should be designed to provide students with a course of study that will contribute to their intellectual, social, and economic well-being. Students selected should have the necessary potential and commitment to complete the program successfully.

G1. Describe the potential students for the program and the primary source of students. Indicate the extent to which the program will attract new students or will draw students from existing programs and provide a specific rationale for these assumptions. For graduate programs, indicate which undergraduate programs would be a potential source of students.

These new program cut across multiple disciplines. Students who will thrive in this program are those who are willing to complete the analytical core of mathematics, computing, and statistics classes. They will also need the "soft" or "essential" skills of communication, team work, management, and ethics. After completing the core, they should become interested in a track or area of emphasis, including business, social science, computer science, statistics, GIS or a combination~~other~~. We expect the number of such options to grow over time. The big data tsunami started with the biological, natural, and astronomical sciences, but there is ample evidence that virtually every domain will be in need of data science support … cybersecurity, history, political science, health science, health, humanities, and so on. The BA program and minor are particularly suited for students seeking double majors. The BS program has room for students to minor in other domain areas.

G2. Estimate the proposed program size and provide projected annual full-time, part-time, and FTE enrollments for one complete cycle of the program. Provide a specific rationale for the assumptions made in the projections. (Depending on the nature of the program, use the FTE or part-time estimates of enrollment on the budget form (select *Academic Program Change Form* and see also *Budget Form Instructions*).

We estimate 17 students to enter the program in the first year, 21 in the second, 26 in the third, and 34 in the fourth, with an eventual leveling off around 100-150 total enrolled in the program going forward.

G3. Indicate how the institution provides programs and services designed to assist students in achieving their academic goals.

The academic strategic plan explicitly states the creation and support of a data science program as a strategic action. The creation of the Big Data Institute and the HPC and Research Computing Core Facility are in development and will support the data science program. Eight new tenure track hires arrived in Fall 2016 as an interdisciplinary cluster hire and will also support the program.

G4. List the program admission and retention requirements for students. Provide descriptions of the specific criteria and methods used to assess students' ability to benefit from the program. Describe how satisfactory academic progress will be determined.

Students will arrive University College and transfer into the program in Arts and Sciences ~~or Business~~ after they have completed CSC 106, MTH 141 (or 131), MTH 215, and STA 409 and have maintained a 2.0 GPA over all and an 2.0 GPA in their required core Data Science Program courses to date.

G5. Indicate available funds for assistantships, scholarships and fellowships. (Include this information on the budget form (select *Academic Program Change Form* and see also *Budget Form Instructions*).

H. ADMINISTRATION: Administrative oversight for the program should be sufficient to ensure quality.

H1. Indicate how the program will be administered and the degree to which this work will affect the administrative structure in which it is located.

The interdisciplinary committee that developed this program will continue to manage the program. Each member of the committee will be responsible for securing advisors for the program. Professional advisors from University College who are assigned to the STEM disciplines will advise students with the assistance of program committee members from Mathematics, Computer Science, and Statistics. Program committee members will also assist in assigning upper level students to suitable advisors. Faculty from the domain disciplines (CELS and GSO), will also be invited to advise upper level students along with faculty from the core areas of computing, mathematics, statistics and business, as will faculty from the Big Data Collaborative. For example, the Big Data cluster hire consists of eight tenure track faculty from six colleges, and the Collaborative now has several dozen faculty

across seven colleges capable and interested in mentoring and advising students. The colleges are Arts & Sciences, Business, CELS, Health, Oceanography, Pharmacy, and Engineering.

H2. Indicate the titles of the persons who will have administrative responsibility for the program and the percent of time each will spend on the program.

Professor Joan Peckham, Chair Computer Science and Statistics, and Coordinator of the Big Data Initiative will supervise the program assume administrative responsibility with the assistance of the interdisciplinary program committee. Peckham is stepping down from the Computer Science & Statistics chair position and plans to assume greater responsibility for coordination of the Big Data Initiative as of Summer 2017. She will allocate 25% of her time to coordination of the Data Science Program.

H3. Indicate additional annual administrative salaries and related costs to be associated with the program. Distinguish between existing resources and new resources. (Include this information on the budget form (select *Academic Program Change Form* and see also *Budget Form Instructions*).

I. INSTRUCTIONAL RESOURCES: The instructional resources should be sufficient in quantity, quality, and timeliness to support a successful program.

I1. Estimate the number and cost of relevant print, electronic, and other non-print library materials needed (and those available) for the program and compare with recommendations of national accrediting agencies.

Few additional materials will be needed in the library to support the program, except copies of required texts for students unable to purchase their own. Supporting journals or other materials will be similar to those already requested for the Statistics, Mathematics, and Computer Science classes, or the upper level domain classes, all of which already exist and have made requests in the past.

I2. Identify and evaluate other instructional resources and instructional support equipment (such as computers, laboratory equipment, supplies, clinical space, internships, proctors) in terms of overall capability to satisfy the needs of the program. If these instructional resources are considered insufficient or if upgrading is necessary for the development of the program, the additional needs should be detailed and their cost estimated.

No additional labs or instructional resources will be needed beyond what is already requested for the computer science, mathematics, and statistics classes already in existence. Course fees will be used to support any exceptional laboratory and instructional support as are already are in place for the program courses.

I3. Estimate annual expenditures for instructional resources. Distinguish between existing resources and new resources. The information should reflect the annual operation and maintenance of the instructional resources, recurrent costs and costs for necessary additions. (Include this information on the budget form (select *Academic Program Change Form* and see also *Budget Form Instructions*).

I4. Provide a Library Impact Statement.
Please see Appendix C
LibraryImpactStatement.NewDataSciencePROGRAM.FacultyForm.rev12-10

J. FACILITIES AND CAPITAL EQUIPMENT: Facilities and capital equipment should be sufficient in quantity, quality, and timeliness to support a successful program.

J1. Describe the facilities and capital equipment (e.g., classrooms, office space, laboratories, and telecommunications equipment) and assess the adequacy of these resources relative to the program and to the requirements of the American with Disabilities Act and state disability statues.

The new HPC and Research Computing Core Facility will also support additional training and computing resources as needed in the program. The library is creating a technology floor to support interdisciplinary engagement around Big Data. This will also support projects that involved undergraduate students in the Data Science Program.

J2. If new or renovated facilities are necessary, explain in detail (e.g., requirements, costs, sources of revenue, and expected date of completion). (Include this information on the budget form (select *Academic Program Change Form* and see also *Budget Form Instructions*).

None needed.

J3. Estimate the annual additional expenditures for new program facilities and capital equipment. (Include this information on the budget form (select *Academic Program Change Form* and see also *Budget Form Instructions*).

J4. Indicate whether the needed facilities are included in the institution's master plan.

K. FINANCIAL CONSIDERATIONS: Projected revenues should be sufficient to support a successful program and must cover the estimated costs of the program.

K1. Expenditures for program initiation and annual operation should be estimated and displayed in the proposed budget. The summary should enable the reader to understand expenditures for a period representative of one full program cycle.

K2. Revenue estimates should be provided for a similar period of time. For a new program, the appropriateness and feasibility of instituting differential tuition and/or fees should be addressed.

***NOTE:* Excel budget forms (select *Academic Program Change Form* and see also *Budget Form Instructions*) are self-calculating.**

K3. Describe how current institutional resources will be redeployed or extra institutional resources will be obtained to support the program (e.g., describe program eliminations, staff reallocations and/or external sources of monies).

L. EVALUATION: Appropriate criteria for evaluating the success of a program should be developed and used.

L1. List the performance measures by which the institution plans to evaluate the program. Indicate the frequency of measurement and the personnel responsible for performance measurements. Describe provisions made for external evaluation, as appropriate.

The program was developed in response to industrial need. Data indicates that data science jobs are growing as quickly as computing and technical jobs. So, the program's success will be evaluated using the following:

- **Has the program attained critical mass? Are the enrollments sufficient to justify continuation of the program?**
- **Do the students secure jobs after completing a degree in data science? Are these jobs related to data: the procurement, archival, analysis, and communication of data?**
- **Are employers happy with the preparation that students receive in the program. We will work through the URI Foundation to assist us in forming an advisory committee from industry (and perhaps Commerce RI) to help us to determine this.**
- **Please see our assessment plan that we developed with SLOAA to internally assess that we have accomplished our learning objectives in the program.**

This will be reviewed following the university's academic review process which happens every six years. So we will do our first review after the program's sixth year.

L2. Describe and quantify the program's criteria for success.

Please see L1. We will aim for success levels on par with the existing Computer Science Program: 1) Near 100% placement into jobs, and 2) Industry reporting that we are doing a sound job of training students in the core hard and soft skills needed to perform in the data industry.

L3. If the proposed program is eligible for specialized accreditation, indicate name and address of the accrediting agency and a list of accreditation requirements. If specialized accreditation is available but not sought, indicate reasons.

N/A

L4. Describe the process that communicates the results of the program evaluation to appropriate institutional stakeholders and uses the outcomes for program improvement.

URI now requires regular and ongoing program assessment and report to the administration. We will participate and report as required.

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THINK BIG WE DO

Academic Program Proposal Cover Page

1. Name/Contact Information: Joan Peckham, joan@cs.uri.edu, 401-874-4174

2. Originating from (please fill in all that apply): Big Data Collaborative

CSC, MTH, BUS (Department) Arts and Sciences, Busines (School/College) (Division)

3. Program type: Undergraduate ☑ (attach Curriculum Sheet) Graduate ☐ (attach List of Requirements)

4. Proposing **New** ☑ or **Change** ☐ to the following (see **Instructions** for definitions): (select all that apply)

Department: ☐ Degree: ☑ Program: ☐ Major: ☑ Sub plan: ☐ (option, track, concentration) Other: ☑

Title/name of proposed Department: Big Data Collaborative

Title/name of proposed Degree: BA, BS, and minor

Title/name of proposed Program: Data Science

Title/name of proposed Major: Data Science

Classification of instruction program (CIP) code: CIP Index 11.0401, 30.3

Title/name of proposed Sub plan:

CIP code (if different from above): CIP Index

Other:

5. Proposed Degree(s) (BS, BA, BFA, MA, MS, Ph.D, etc.): BA, BS, Minor

6. Intended initiation date: Term Fall Year 2018

7. Anticipated date of granting first degree: May 2022

8. Intended location of program: Kingston ☑ Providence ☐ Narragansett Bay Campus ☐

9. Total Credits Required for Graduation: (120, 130, etc) 120 for B

10. Certification/Licensing Requirements: Yes ☐ (provide brief description) No ☑

Office Use Only:
College Curriculum Committee _____Curricular Affairs Committee _____ Graduate Council _____
Faculty Senate _____ President _____ RIBGHE _____ Enrollment Services _____

Appendix A

Data Science BA Curriculum Sheet

Data Science BA Curriculum Sheet

DSP Minor

Data Science BA Sample schedule

Data Science BS Sample schedule

Course Descriptions for new proposed courses – to be submitted to Faculty Senate in Fall 2017

List of Course Prerequisites

Letters of support from departments

Data Science - BA

Fall 2016 - Present

120 Total Credits
38-40 Program credits

This form is for reference only. Student should consult catalog to confirm degree requirements

Major Requirements (32-33 Credits):			
Course #	**Semester**	**# Credits**	**Grade**
CSC 201 or 211		4	
CSC 320		4	
STA 409		3	
MTH 215		3	
CSC 310 or STA 305		4	
STA 441 or CSC 461		4	
BUS 456		3	
One course from selected Data Science related specialization or domain areas from the list below			
		3/4	
One additional data science integrative or capstone or internship course at the 300-level or above.			
CSC 499 or STA 490		4	

Additional Required courses: (6-7 credits)			
Course	**Semester**	**# Credits**	**Grade**
MTH 131 or 141		3 or 4	
Writing			
WRT 201 or HPR 112		3	
Strongly Suggested but not required			
WRT 227		3	

******Please note: Student cannot graduate without major and cumulative GPA of at least 2.0*****

Students are encouraged to complement this BA with a major or minor in another data dependent domain.

Students are required to take at least 42 credits at the 300 level or higher. Major and general education courses may fulfill this requirement.

General Education Requirements: 12 Outcomes & 40 Credits			
	Course	**Credits**	**Grade**
Knowledge			
A1. STEM			
A2. Social & Behavioral Science			
A3. Humanities			
A4. Arts & Design			
Competencies			
B1. Write Effectively			
B2. Communicate Effectively			
B3. MATH			
B4. Information Literacy			
Responsibilities			
C1. Civic			
C2. Global			
C3. Cultural			
Integrate & Apply			
D1. Ability to Synthesize			
G: At least 1 course above must be a Grand Challenge			
General Education Electives			
Total Credits (Need 40)			

General Education Policy:

1. A course may be used to satisfy more than one outcome. The outcomes are specified on the syllabus.
2. Minimum of 3 credits for each outcome (A1 … D1)
3. Complete at least one Grand Challenge
4. Complete 40 credits.
5. No more than 12 credits can be taken in one discipline / course code

For a list of courses that satisfy Gen Ed requirements consult the A& S requirements in the catalog from the term that you first matriculated at URI.

Specialization or domain areas:

Biological Sciences: BIO 439X (Big Data Analysis), CMB 320 (Intro. Comput. Bio), BPS/CSC/STA 522 (Bioinformatics I)

Computer Science: CSC 212, CSC 412 (Operating Systems), CSC 415 (Parallel Computing), CSC 436 (DB Systems), CSC 450 (Scientific Computing)

GIS (Geographic Information Systems): LAR 302, or NRS 409 and NRS 410

Mathematics: MTH 418 (Matrix Analysis), MTH 471 (Numerical Analysis) MTH 243 (Calc III), MTH 451 (Intro Probability/STA), MTH 447 (Discrete Math Structures)

Social Science and Humanities: HIS 116 (History of Science), PHL 212 (Ethics)

Oceanography: OCG 350 Oceanographic Data Integration I, and OCG 351 Oceanographic Data Integration II

Statistics: STA 411 or 412 (Biostatistics), STA 460 (Time Series), STA 445 (Bayesian)

Data Science Program: DSP 393

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Data Science BS

120 Credits Total
56-60 Program Credits

Major Requirements: 49-53 credits

Course	Semester	Credits	Grade
Core Courses			
CSC 201* or 211		4	
CSC 320		4	
STA 409		3	
MTH 142*		4	
MTH 215		3	
CSC 310		4	
STA 305		4	
STA 441		4	
CSC 461		4	
BUS 456		3	
Three courses from selected Data Science related specialization or domain areas from the list below			
		3 or 4	
		3 or 4	
		3 or 4	
One Integrative Class or Capstone from a data science or related domain area			
CSC 499 or STA 490		3 or 4	
Additional Required Courses – 7 Credits			
MTH 141*		4	
WRT 201* or HPR 112*		3	
Strongly Recommended			
WRT 227*		3	

*Course approved for general education credit

Specialization or domain areas:

Biological Sciences: BIO 439X (Big Data Analysis), CMB 320 (Intro. Comput. Bio), BPS/CSC/STA 522 (Bioinformatics I)

Business: DSP 393 (Predictive Analytics) – Currently being considered by A&S curriculum committee and General Education.

Computer Science: Choose three from CSC 212, CSC 412 (Operating Systems), CSC 415 (Parallel Computing), CSC 436 (DB Systems), CSC 450 (Scientific Computing)

GIS (Geographic Information Systems): LAR 302, or NRS 409 and NRS 410

Mathematics: Choose at least two from MTH 418 (Matrix Analysis), MTH 471 (Numerical Analysis) MTH 243 (Calc III), MTH 451 (Intro Probability/STA), MTH 447 (Discrete Math Structures)

Social Science and Humanities: HIS 116 (History of Science), PHL 212 (Ethics)

Oceanography: OCG 350 Oceanographic Data Integration I, and OCG 351 Oceanographic Data Integration II

Statistics: STA 411 or 412 (Biostatistics), STA 460 (Time Series), STA 445 (Bayesian)

All students are encouraged to pursue minors in other data dependent domains.

******Please note: Student cannot graduate without major and cumulative GPA of at least 2.0******

GENERAL EDUCATION GUIDELINES: General education is 40 credits. Each of the twelve outcomes (A1-D1) must be met by at least 3 credits. A single course may meet more than one outcome, but cannot be double counted towards the 40 credit total. At least one course must be a Grand Challenge (G). No more than twelve credits can have the same course code (note- HPR courses may have more than 12 credits). General education courses may also be used to meet requirements of the major or minor when appropriate.

STEP 2:

General Education Credit Count				
At least 40 credits, no more than 12 credits with the same course code				
Course	**Cr.**		**Course**	**Cr.**
			Total Gen Ed credits	40

STEP 3:

General Education Outcome Audit	
	Course
KNOWLEDGE	
A1. STEM	
A2. Social & Behavioral Sciences	
A3. Humanities	
A4. Arts & Design	
COMPETENCIES	
B1. Write effectively	
B2. Communicate effectively	
B3. Mathematical, statistical, or computational strategies	
B4. Information literacy	
RESPONSIBILITIES	
C1. Civic knowledge & responsibilities	
C2. Global responsibilities	
C3. Diversity and Inclusion	
INTEGRATE & APPLY	
D1. Ability to synthesize	
GRAND CHALLENGE	
G. Check that at least one course of your 40 credits is an approved "G" course	

NOTE: This worksheet sheet is a snapshot of your entire curriculum. You must work with your advisor each term to discuss requirements to keep you on course for timely progress to complete this major. Official requirements for graduation are listed in the University Catalog.

Please note: Both major and cumulative GPA must be 2.00 or higher in order to graduate.

Minor in Data Science

This minor is intended to provide students with preliminary data collection, manipulation, access and/or analysis skills as are appropriate to data needs in their majors. (22-23 credits)

The following courses are required:

- **4 credits - CSC 201 or 211**
- **3-4 credits – STA 308, 409, 411, or 412**
- **3 credits - MTH 215**
- **4 credits - CSC 310 or STA 492 (Intro STA in R)**
- **4 credits - CSC 461 (Machine Learning) or STA 441 (Multivariate Methods)**
- **4 credits – CSC 320 (Social Issues in Computing)**

Optional: In addition each student is encouraged to take one class that is integrative and that is focused in applying data science principles/skills to a data intensive domain area. For example, CSC 499, STA 492consul, etc.

BS Sample Schedule

Fresh Fall	*14*	*Fresh Spr*	*17*	31
CSC 106 (B3)	4	CSC 110	4	
WRT 104 (B1, B4)	3	MTH 141 (A1,B3)	4	
PHL 101 (A3, B3)	3	PSY 103 (A2, B1)	3	
URI 101	1	FLM 204 (A4, C2)	3	
Elective/MTH111	3	HIS 150 (C3)	3	
Soph Fall	*15*	*Soph Spr*	*17*	32
CSC 211	4	CSC 212	4	
MTH 142 (B3)	4	MTH 243 (A1, B3)	3	
BIO 101 (A1)	4	PHY 203 (A1)	4	
Elective	3	Elective	3	
		WRT 332 (B1, B2)	3	
Junior Fall	*15*	*Junior Spr*	*15*	30
CSC 301	4	CSC 412	4	
CSC 305	4	CSC 3XX (prog)	4	
CSC/CSF 3XX	4	CSC 340	4	
MTH XXX	3	Elective	3	
Senior Fall	*15*	*Senior Spr*	*16*	31
CSC 411	4	BUS 104 (C1, G)	3	
CSC 440	4	CSC/CSF 3XX	4	
CSC 499 (D1)	4	Elective	3	
Elective	3	Elective	3	
		Elective	3	
		Total Credits		124

Major Requirement	56
Additional Major Requirement	28
Elective	24
URI 101	1
Non-major Gen Eds	15
Total Credits	124

Major Gen Eds	33
Total Gen Eds	48

General Education	Course	Credits
Knowledge		
A1. STEM	MTH 141	4
A2. Social & Behavioral	PSY 103	3
A3. Humanities	PHL 101	3
A4. Arts & Design	FLM 204	3
Competencies		
B1. Write effectively	WRT 104	3
B2. Communicate effectively	WRT 332	3
B3. Math, stat or comp	CSC 106	4
B4. Info literacy	WRT 104	0
Responsibilities		
C1. Civic knowledge	BUS 104	3
C2. Global responsibilities	FLM 204	0
C3. Diversity & inclusion	HIS 150	3
Integrate and Apply		
D1. Ability to synthesize	CSC 499	4
Grand Challenge		
	BUS 104	0
Other Gen Eds		
	MTH 142	4
	MTH 243	3
	BIO 101	4
	PHY 203	4
Total		48

BA Sample Schedule

Fresh Fall	*13*	*Fresh Spr*	*16*	29
PHL 101 (A3, B2)	3	MTH 131 (A1, B3)✓	3	
WRT 201 (B1, B4)✓	3	CSC 201 (B3)	4	
Gen Ed	3	GenEd	3	
URI 101	1	GenEd	3	
Elective/MTH111	3	GenEd	3	
Soph Fall	*17*	*Soph Spr*	*16*	33
CSC 201 or 211✓	4	CSC 310 (STA492C)	4	
STA 409	4	BUS 456	3	
MTH 215	3	Elective	3	
Gen Ed	3	\	3	
Gen Ed	3	STA 409	3	
Junior Fall	*19*	*Junior Spr*	*17*	36
Elective (300+)	4	STA 492C	4	
STA441	4	DSP 300+	3	
CSC 320	4	Elective (300+)	3	
CSC 461	3	Elective (300+)	3	
GenEd	4	GenEd	4	
Senior Fall	*14*	*Senior Spr*	*13*	27
One Add'l	4	CSC 499 or …	4	
Elective (300+)	3	Elective (300+)	3	
Elective (300+)	3	Elective (300+)	3	
Gen Ed	4	Elective (300+)	3	
		Total Credits		125

Major Requirement
Additional Major Requirement
Non-major gen ed
Elective
Elective at 300-level or above
URI 101
Total Credits

Total 300-level or above
Gen Ed

General Education	Course	Credits
Knowledge		
A1. STEM	MTH 141✓	4
A2. Social & Behavioral	PSY 103	3
A3. Humanities	PHL 101	3
A4. Arts & Design	FLM 204	3
Competencies		
B1. Write effectively	WRT 104✓	3
B2. Communicate effectively	WRT 227✓	3
B3. Math, stat or comp	CSC 106✓	4
B4. Info literacy	WRT 104✓	0
Responsibilities		
C1. Civic knowledge	BUS 104	3
C2. Global responsibilities	FLM 204	0
C3. Diversity & inclusion	HIS 150	3
Integrate and Apply		
D1. Ability to synthesize	CSC 499✓	4
Grand Challenge		
	BUS 104	0
Other Gen Eds		
4 other Gen Eds		14
Total		47

Class Topic Descriptions
For classes that are not yet fully described in the catalog

These four courses are currently being offered as topics courses and will be submitted to the Arts and Sciences Curriculum Committee in April 2017 to be considered by the Faculty Senate in Fall 2017.

CSC 310 Programming for Data Science LEC: (4 crs.) Programming in Python, data sets, data file formats and meta---data, basic descriptive statistics, simple data visualization, basic data models, accessing web data, accessing data bases, distributed data management, map--reduce. (Lec.3, Lab. 2) Pre: CSC201 or CSC211 or equivalent, or permission of instructor

STA 305 Introduction to Statistical Computing with R LEC: (4 crs.) Scientific computing and statistical learning using R. Data representation & visualization: basic data manipulation; data cleaning; normalization and transformation of random variables; exploratory data analysis; data smoothing, optimization methods for model fitting: first and second order methods, linear and nonlinear regression; basic simulation of random processes: simulation of random variables, bootstrapping; cross--validation, importance sampling and Markov chains. Pre: MTH 111 or MTH 131/132 or MTH 141 or STA 220 or STA 308; or permission of instructor.

CSC 461 Machine learning LEC: (4 crs.) Broad introduction to fundamental concepts of machine learning, adopting a non--rigorous approach with emphasis on the development of intuition and skills. Survey of traditional and newly developed learning algorithms, as well as, their application to challenging real--world problems. Pre: (MTH141 or MTH215) and CSC 310.

STA 441 Multivariate Statistics - LEC: (3 crs.) Examples of multivariate data organization and visualization. Multivariate normal distribution. Overview of traditional tests of hypotheses on mean vectors, MANOVA, Multivariate regression analysis. Cross--Validation and bootstrap. Introduction to supervised learning via Regression and Classification, and unsupervised learning via principal component analysis and Clustering. (Lec. 3) Pre: STA 409, STA 411, or STA 412.

STA 490 – Statistics in Practice. (4 crs.) In this class, students will learn to use computational statistical techniques to consult on active projects. These projects will be chosen by the instructor for students to work individually and in groups to work as consultants, interact with clients, and prepare reports with the results of their analyses. Prerequisites: (STA 411 or STA 412) and STA 441; or permission of instructor.

Course Titles and Prerequisite chains:

COURSE NUMBER	Course Title	Depart	Prerequisites
CSC 201	Intro. Computer Program.	CSC	MTH 111 or equivalent
CSC 211	Object Oriented Program.	CSC	MTH 111
CSC 320	Social Issues in Computing	CSC	CSC 211 or CSC 201
STA 409	Sta. Methods in Research I	STA	MTH 131 or 141
MTH 141	Intro. Calc. w/ Analytic Geometry	MTH	Placement test or C- or better in MTH 111
MTH 215	Linear Algebra	MTH	- C+ or better in MTH 131 or MTH 141 or equivalent
CSC 310	Programming for Data Sci.	CSC	CSC 201 or 211
STA 441	Multivariate Statistics	STA	STA 409, 411, or 412
CSC 461	Machine Learning	CSC	(MTH 141 or MTH 215) and CSC 310
BUS 456	Management of Databases	BUS	Junior or degree granting college
CSC 499	Project in Computer Science.	CSC	Advanced standing in computer science or departmental approval.
STA 305	Introduction to Statistical Computing with R	STA	MTH 111 or MTH 131/132 or MTH 141 or STA 220 or STA 308; or permission of instructor
STA 490	Statistics in Practice	STA	(STA 411 or STA 412) and STA 441; or permission of instructor.
MTH 142	Intermed. Calc. W/ Analytic Geometry	MTH	C- or better in MTH 141 or permission of chair
CSC 106	The Joy of Programming	CSC	Not open to students with credit in CSC courses at 200-level or above
WRT 227	Business Communications		Currently only open to Business and writing students.

Please find impact statements from the following departments/colleges below:

1. **Business**
2. **Writing and Rhetoric**
3. **Mathematics**
4. **Philosophy**
5. **Landscape Architecture**
6. **Biology**
7. **Cell and Molecular Biology**
8. **GSO (Graduate School of Oceanography)**

1 -Business:

From: Maling Ebrahimpour <mebrahimpour@uri.edu>
Subject: Re: Data science program
Date: February 9, 2017 at 6:43:47 PM EST
To: Joan Peckham <joan@cs.uri.edu>, Deborah Rosen <drosen@uri.edu>, Seung Kyoon Shin <skshin@uri.edu>

Dear Joan,

Please see my response below:

Can you please write me a message signaling that you are willing to revive the BUS 456 - Management of Database class for the degree program. I am guessing that once the program is ramped up, there would be about 30-40 students a year in the class. So it would have to be taught once a year in the beginning. If the major becomes very popular, we could discuss max class size and if it needs to be taught every semester. But that will probably not happen for a while.

Of course, I would be willing to do this.

2-Writing and Rhetoric:

On Feb 12, 2017, at 12:32 PM, Jeremiah Dyehouse <jdyehouse@uri.edu> wrote:
Hi Joan--

The Department of Writing and Rhetoric is enthusiastic about offering Data Science students educations in writing. At present, and as we have discussed, I

cannot promise these students entry into WRT 227. However, I will make sure that we can accommodate these students in WRT 104, WRT 106, WRT 201 (or HPR 112), and WRT 332. Also, as we discussed, I will actively pursue the possibility of offering a professional or business writing course (i.e., a course that is similar to WRT 227) for students in majors other than business. Hopefully, we will be able to have that course regularly available within the next two years.

In addition, I am also excited to work on the development of a specialized course in writing, rhetoric, and data visualization. As your message indicates, such a course could be an excellent fit with the Data Science curriculum. More generally, as my faculty considers how best to address URI's current deficit in this area, I look forward to continuing to work with you and your faculty.

Please let me know what else I can do to support your important work on the Data Science major--

Yours sincerely,

Jeremiah
--
Jeremiah Dyehouse
Associate Professor and Chair, Department of Writing and Rhetoric
Harrington School of Communication and Media
University of Rhode Island
email: jdyehouse@uri.edu

3- Mathematics:

Dear Joan,

The department of mathematics is excited to be part of these new degrees, (Data science BA and Data Science BS). We can accommodate the initial increase in students as stated in your proposal in MTH131, MTH 141, MTH 142, and MTH 215 the first (2017-18) and second (2018-19) years.

However, we must have additional resources to fully support the program beyond the initial two start-up years. The mathematics department will need a tenure-track faculty member to help teach MTH 215 and any additional sections of the upper level courses that students will presumably take in their junior/senior year (MTH 243, MTH 418, MTH 447, MTH 451, and MTH471) in the math specialization/domain area of the Data Science degrees.

As we all know, mathematics is one of pillars of data science (see e.g. NSF call for proposal TRIPODS) and an additional tenure-track faculty member

in our department with a specialization area that would support the collaboration among computer science, statistics and mathematics is a requirement for us to continue to support the Data Science degrees.

Furthermore, since MTH 131, 141, and 142 are part of the core curriculum we will need additional two graduate teaching assistants (TAs) as the program starts to grow beyond years one and two. TAs typically teach a section of theses courses and provide significant support for course instructors, i.e. TAs monitor online homework systems, tutor, work on Mathematica projects, and run just-in-time online modules.

Best,
Jim

****

James Baglama
Professor and Chair
Department of Mathematics
University of Rhode Island
jbaglama@uri.edu
http://www.math.uri.edu/~jbaglama
Phone: 401-874-2709
Fax: 401-874-4454

****

4- Philosophy:

To: Joan Peckham and the A&S Curricular Affairs Committee

From: Susan Brady, Chair of Philosophy

Re: Impact of PHL 212 as requirement for Data Science majors; future plans

Date: Feb. 27, 2017

I am writing in support of the proposal for the Data Science BA and BS majors currently being proposed. One course, PHL 212 (Ethics) is listed as an option for students focusing on a specialization in Social Sciences and Humanities. At the present, the Philosophy Department can accommodate the students predicted in the early years of this major. As the program grows, the staffing needs for PHL 212 for these majors and the others requiring this course for their majors would need to be reviewed and addressed as possible.

The Philosophy Department has submitted a proposal for a new Assistant Professor position for an individual with a specialization in Philosophy of Mind and a competency in Data and Research Ethics. This proposal, supported by Professor Peckham, would have strong relevance for the Data Science majors and the Big Data program. We anticipate that the person hired would provide a course on Data and Research Ethics for individuals in these majors.

5- Landscape Architecture:

Chair, Computer Science and Statistics

Dear Joan,

This note is in response to your request for an ***Impact Statement*** from the Department of Landscape Architecture regarding the proposed Data Science BA-BS curriculum to allow several students majoring in this new curriculum an opportunity to enroll in ***LAR302 Applied GIS for Landscape Architecture*** annually.

We are aware that LAR302 would not be a core part of the curriculum, and that each student in the Data Science BA and BS degree is required to take a certain number of eligible data oriented classes at the 300 level or above. Since LAR302 will not be a core requirement in the curriculum we welcome the addition of several students per year into LAR302 as we believe that the cross-discipline interaction amongst students and faculty will benefit both the Data Science majors as well as the Landscape Architecture majors.

Please let me know if you need any additional information regarding this Impact Statement.

Sincerely,

Angelo Simeoni

Chair, Dept. of Landscape Architecture

6- Biology:

Dear Joan -

The URI Department of Biological Sciences is excited to have the course BIO 439X, 'Big Data Analysis', included as one of the offerings in the 'Biological Sciences' Domain Area for the proposed BA and BS Data Science program. We do not attach any conditions to this approval, and do not require any additional resources to teach the course. Warm regards -

Evan Preisser

7-Cell and Molecular Biology:

Hi Joan,

CMB approves and supports the inclusion of CMB320 in your data science program. Because this is a very hands-on class, requiring significant one-on-one instructor-student interaction, the capacity of the class will be limited without additional support, but we will work with you to increase the capacity if it is needed.

Gongqin

Gongqin Sun
Professor and Chair
Department of Cell and Molecular Biology
University of Rhode Island
Kingston, RI 02881
401-874-5937
Dear Joan -

The URI Department of Biological Sciences is excited to have the course BIO 439X, 'Big Data Analysis', included as one of the offerings in the 'Biological Sciences' Domain Area for the proposed BA and BS Data Science program. We do not attach any conditions to this approval, and do not require any additional resources to teach the course. Warm regards -

Evan Preisser

8-GSO

MEMORANDUM
TO: Joan Peckham, Chair Computer Science and Statistics
FROM: David C. Smith, Associate Dean GSO
DATE 9 March 2017
SUBJECT: Data Science Program Proposal

We would appreciate the inclusion of OCG 350 Oceanographic Data Integration I and OCG 351 Oceanographic Data Integration II as elective upper level courses in your Data Science Program proposal. These courses will be in a new Proficiency in Ocean Data Science minor that we are currently proposing. We will seek additional resources to support these courses as your program grows.

Appendix B

Student Learning outcomes:

Data Science Assessment Plan

SLOAA Feedback on Assessment Plan

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New Program Proposal Student Learning Outcomes Assessment Plan
(Accredited, Non-Accredited and Certificate Programs)

DATE of SLOAA Review: 02/16/2017
DATE of LOOC Review: 2/17 /2017

Each new program that is being proposed must have clearly articulated program learning goals and student learning outcome statements linked to curriculum and course experiences/requirements. The Plan also requires each program to create an assessment timeline indicating a commitment to assess outcomes during the two-year assessment cycle (noting when and how learning outcomes assessment is planned).

Program Information:

Program:	**Data Science**
Academic year proposal submitted:	FY '17
Degree(s):	BA, BS, and a minor
Department Chair:	Joan Peckham, Data Science Collaborative
Program Director:	Joan Peckham and Julia Lovett
Accredited Program:	☒**No** ☐**Yes, next accreditation report due:**

Program Goals: Goals should relate to the mission of the department, college, and university in which the program resides. These broad, general statements encompass what it means to be an effective program. Goals are evaluated by measuring specific student learning outcome statements related to the individual goal: what the program expects students to know and be able to do upon completion of the program.

#1	**Demonstrated ability to collect, manage and use data**
#2	**Demonstrated ability to examine, analyze and interpret data**
#3	**Communicate effectively about data**
#4	**Demonstrate "No-Boundary Thinking" working effectively in diverse and interdisciplinary groups**
#5	**Apply ethical and legal knowledge to aspects of data management and the impact of data on society**

THE
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New Program Proposal
Student Learning Outcomes Assessment Plan
(Accredited, Non-Accredited and Certificate Programs)

Curriculum Mapping:
(Section E3/E4a of the proposal)

Success in achieving goals is evaluated directly or indirectly by measuring specific learning outcomes related to the goal. Across the top of the matrix, list courses and other requirements for the program, ordered from left to right in the usual chronological sequence. Down the side of the matrix, list programmatic student learning outcomes associated with goals. Using the **Map Key** below, indicate the degree to which an outcome will be taught and/or assessed in relevant courses.

Program:

MAP KEY
I = Outcome Introduced
R = Outcome Reinforced
E = Outcome Emphasized

Course Numbers/Program Requirements:
In addition to specific course requirements, please include other requirements that may not be associated with a course number such as internships, service learning, portfolios, and thesis/dissertation proposals or defenses, and comprehensive exams for graduate programs.

Required Core Courses

Student Learning Outcomes (Competencies) by Goal: Statements of observable, measurable results of the educational experience that specify what a student is expected to know or be able to do throughout a program. Outcomes are linked to overarching broader program goals and must be detailed and meaningful enough to guide decisions in program planning, improvement, pedagogy, and practice.		CSC 201 or 211	STA 409	CSC 310	CSC 320	BUS 456 (DB)	CSC 461	STA 441	One Additional CSC/STA course at 300 level	One additional integrative class	MTH 215	STA 492C					
Goal #1 Collect, manage and use data	1.1 Students will collect, organize, and archive data			I				I	R	E	R	R					
	1.2 Students will program data in order to manipulate data	I/E		R			R	R		E	R	R					
Goal #2 Examine, analyze and interpret data	2.1 Students will explore and analyze date to construct predictions and infer conclusions		I	I		I	E	R			R	R					
	2.2 Students will interpret data using theoretical structures to solve problems and make decisions		I	I		I	E	R			I	R					
Goal #3 Communicate effectively	3.1 Interpret and present data and data analysis results for experts and the general public		I	I			R	R	R	R	R	R					
	3.2 Create data visualizations to support the		I	I			R	R	R		R	R					

New Program Proposal
Student Learning Outcomes Assessment Plan
(Accredited, Non-Accredited and Certificate Programs)

Goal #4 Demonstrate "No-Boundary Thinking" working in groups	4.1 Students will engage effectively in diverse and interdisciplinary groups on data driven problems.			I/E			R	R	R			R						
Goal #5 Apply ethical and legal knowledge	5.1 Apply knowledge of the ethical and legal impact of data on society to make informed decisions.				I/E				R			R						

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New Program Proposal
Student Learning Outcomes Assessment Plan
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Assessment Timeline:

(Section E4b of the proposal)

Indicates when and how student learning will be assessed based on learning outcome statements and expectations. Refer to the curriculum map to propose an assessment timeline in which you will plan to assess the program-level student learning outcomes. Note: Specify a 6-year plan for assessment to represent **3 two-year reporting periods**:

Assessment Reporting Period 1: the first academic year in which the program would plan to assess at least one outcome.
Assessment Reporting Period 2: follows two years later, with plans defined for assessing another outcome(s).
Assessment Reporting Period 3: follows two years later, with plans defined for assessing additional outcome(s).

All goal areas should be assessed by at least one outcome during the 6-year plan.

Academic Reporting Year(s)	Outcome(s)	Course(s) and Other Program Requirements	Assessment Evidence (direct/indirect)	Assessment Method
	WHICH outcome(s) will you examine in each period? **(Use number(s) from curriculum map, e.g. 1.1)**	**WHERE will you look for evidence of student learning (i.e., what course(s)/program requirements)? (Designate for each outcome noted.)**	**WHAT student work or other evidence will you examine in order to generate conclusions and recommendations? (Designate for each requirement noted.)**	**HOW will you look at the evidence; what means will you use to quantify the evidence?** **(Designate for each source of evidence noted.)**
Assessment Reporting Period 1[1]: Report due May 2019	1.5 2.1	1.5: CSC 106, 201 and/or 211 2.1: – STA class projects	1.5 – Sample programming assignments 2.1– Sample group projects from STA classes completed	1.5: Assess with suitable rubric to be developed by faculty 2.1: Assess with suitable rubric to be developed by faculty
Assessment Reporting Period 2: Report due May 2021	3.1 2.2	3.1 – CSC 461 & STA 441 2.2 – CSC 461	Sample projects and assignments	Assess with suitable rubrics – to be developed
Assessment Reporting Period 3: Report due May 2023	5.1 4.1	5.1 – CSC 320 & Integrative/Capstone 4.1 – Integrative/Capstone	5.1 - Sample assignments (320), final project reports (integrative/capstone) 4.1 – Instructor and student team assessments of success	Assess with suitable rubrics – to be developed

New Program Proposal
Student Learning Outcomes Assessment Plan
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[1] Initial reporting year will depend on timeframe for program implementation and student cohort size.

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NEW PROGRAM ASSESSMENT PLAN REVIEW

DATE of SLOAA Review: 02/16/17
DATE of LOOC Review: 02/ 17/17

Academic Program/Degree: Data Science
College: College of Arts and Science
Date New Program Assessment Plan Submitted: Feb 15, 2017 (prior drafts, discussions, meetings)
Faculty Member(s) Submitting Plan Proposal: Joan Peckham (Dept Chair, Data Science Collaborative), Julia Lovett

FEEDBACK

Strengths:

SLOAA:

- The Assessment Plan details the specific skills, knowledge and competencies students will acquire and be able to demonstrate within the major highlighting 5 goal areas
- The number of program goals reflects the breadth of the program, and are defined by the learning outcome statements which link to the curriculum
- The curriculum map highlights opportunities for students to practice and reinforce their learning, ensuring students have repeated opportunity for building on their coursework. The map also acknowledges the unique nature of this major whereby students are introduced to certain skills which are also emphasized to an essential level of mastery early on. This is necessary to succeed in latter courses which continue to reinforce the essential skills necessary to solve problems.
- The timeline presents plans for evaluation of all goals within the next 3 assessment cycles through at least one outcome, sometimes using the same student evidence to assess multiple outcomes.

LOOC: Agree with the SLOAA comments above.

Suggestions for improvement:

SLOAA: Program responded to questions or concerns during preliminary planning and discussions.

LOOC: None.

Issue(s) of note:

SLOAA: Once approved, the program is expected to post the student learning outcomes on the program URL. This link will be expected within the first assessment report.

LOOC: Agree with SLOAA comment above.

Assessment Plan Designation:

1 [X]	2 [ ]	3 [ ]
The Assessment Plan is ready for implementation	The Assessment Plan can be implemented after minor revisions, as indicated, and does not require further review	The Assessment Plan requires revisions, and should be submitted for further review after revisions, by date:

Program Information		Reviewer Ratings & Comments				
Information box complete		☒ Yes ☐ Incomplete		***Suggestions:***		
Criteria		***Efficacy of Plan Description & Content***				***Suggestions for improvement***
		Less Developed	**Developing**	**Well Developed**	**Not addressed**	
PART I	**1. Program goals**					
	a. Broad statements of program learning goals	☐	☐	☒	☐	
	b. Limited in number (ideally 2-5)	☐	☐	☒	☐	(Appropriate for this program)
PART II	**2. Learning outcomes/competencies**					
	a. Linked to goals (numbered 1.1 etc.)	☐	☐	☒	☐	
	b. Each goal is represented by at least one outcome	☐	☐	☒	☐	
	c. Statements are observable/measurable	☐	☐	☒	☐	
	d. Directed at what students will know or be able to do	☐	☐	☒	☐	
	e. Reasonable number (ideally 1-3 per goal)	☐	☐	☒	☐	
	3. Curriculum Map					
	a. Program requirements are listed, developmentally when possible	☐	☐	☒	☐	
	b. Outcomes are linked to appropriate requirements	☐	☐	☒	☐	

	Criteria	Reviewer Ratings & Comments				
		Efficacy of Plan Description & Content				*Suggestions for improvement*
		Less Developed	**Developing**	**Well Developed**	**Not addressed**	
PART III	**4. Assessment Timeline (3-year plan)**					
	a. Assessment Reporting Period 1 is thoroughly presented	☐	☐	☒	☐	
	b. Assessment Reporting Periods 2 and 3 are presented	☐	☐	☒	☐	
	c. All goals are represented by at least one outcome somewhere in the 3 reporting periods	☐	☐	☒	☐	
	d. Requirements are clearly stated and connected to outcomes (from Curriculum Map)	☐	☐	☒	☐	
	e. Evidence is stated for each designated outcome	☐	☐	☒	☐	
	f. Selection of evidence takes advantage of existing indicators	☐	☐	☒	☐	
	g. Evidence is stated in enough detail to guide assessment activities	☐	☐	☒	☐	
	h. Evidence is feasible for collection within the timeline	☐	☐	☒	☐	
	i. Methods for quantifying evidence are stated for each designated outcome	☐	☐	☒	☐	Outstanding: rubrics will be developed to include performance criteria
	j. Methods are appropriate for evidence	☐	☐	☒	☐	

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1892–2017

THINK BIG WE DO℠

BUDGET AND FINANCIAL PLANNING
Adams House, 85 Upper College Road, Kingston, RI 02881 USA p: 401.874.2509 web.uri.edu/budget

DATE: March 29, 2017

TO: Nancy F. Neff
Coordinator, Faculty Senate

FROM: Linda Barrett
Director, Budget and Financial Planning

SUBJECT: Proposal for Big Data Collaborative BA, BS, and Minor in Data Science

As requested in an email from Joan Peckham, Department Chairperson and Professor of Computer Science, dated March 9, 2017, the Budget and Financial Planning Office has reviewed the submitted documents related to the proposal for Big Data Collaborative BA, BS, and Minor in Data Science.

According to the submission, the proposal for Big Data Collaborative BA, BS, and Minor in Data Science will be offered through the College of Arts and Sciences, and will provide URI students with the skills and knowledge of applying critical problem solving methods, ethical and communication skills, and require a capstone course, an internship, or a research project. Ms. Peckham referenced in the submission that the rationale is to find coherent structure for existing courses that define the programs, along with filling a need for coursework in Math, Statistics, and Computer Science classes.

The Budget and Financial Planning Office, after consulting with Enrollment Services, concurs that the request from Big Data Collaborative BA, BS, and Minor in Data Science will have an impact on the Fund 100 unrestricted budget. The number of net new additional students expected to be integrated into the program is sufficient to offset the net new additional expenses as presented. The impact to the Enrollment Services budget will be approximately $1,000 for technical requirements to set up the program for implementation.

Please let us know if you require any further information.

cc: Donald DeHayes
Dean Libutti
Nancy Eaton
Joan Peckham
Colleen Robillard
Laura Beauvais
Winifred Brownell
Patricia Morokoff
Cheryl Hinkson

Office/BudgetImpactStatements/Bigdatacollaborativeba,bs,and minor in Data Science/BudgetImpactStatementLetter.final

ACADEMIC PROGRAM BUDGET FORM

Use this form for programs that can be pursued on a full-time basis, part-time basis, or through a combination of full-time and part-time attendance.

Choose one: □ Full-time □ Part-time □ Combination of full- and part-time

REVENUE ESTIMATES

	FY '18 - Year 1		Year 2		Year 3		Year 4	
	2017 (FY18)		2018 (FY19)		2019 (FY20)		2020 (FY21)	
Tuition: In-State	$12,002		$12,390		$12,390		$12,390	
Tuition: Out-State	$28,252		$29,136		$29,135		$29,135	
Tuition: Regional	$21,230		$21,230		$21,230		$21,230	
Mandatory fees per student	$1,790		$1,822		$1,822		$1,822	
FTE # of New Students: In-State	8		10		12		15	
FTE # of New Students: Out-State	4		5		7		9	
# of In-State FTE students transferring in from the institution's existing programs	3		4		5		5	
# of Out-State FTE students transferring in from the institution's existing programs	2		2		2		4	
TUITION AND FEES	Newly Generated Revenue	Revenue from existing programs	Newly Generated Revenue	Revenue from existing programs	Newly Generated Revenue	Revenue from existing programs	Newly Generated Revenue	Revenue from existing programs
First Year Students								
In-State tuition	$96,016.00	$36,006.00	$123,900.00	$49,560.00	$148,680.00	$61,950.00	$185,850.00	$61,950.00
Out-of-State tuition	$33,902.40	$16,951.20	$43,704.00	$17,481.60	$61,183.50	$17,481.00	$78,664.50	$34,962.00
Regional tuition	$59,444.00	$29,722.00	$74,305.00	$29,722.00	$104,027.00	$29,722.00	$133,749.00	$59,444.00
Mandatory fees	$21,480.00	$8,950.00	$27,330.00	$10,932.00	$34,618.00	$12,754.00	$43,728.00	$16,398.00
Second Year Students								
In-State tuition			$99,120.00	$37,170.00	$123,900.00	$49,560.00	$148,680.00	$61,950.00
Out-of-State tuition			$34,963.20	$17,481.60	$43,702.50	$17,481.00	$61,183.50	$17,481.00
Regional tuition			$59,444.00	$29,722.00	$74,305.00	$29,722.00	$104,027.00	$29,722.00
Mandatory fees			$21,864.00	$9,110.00	$27,330.00	$10,932.00	$34,618.00	$12,754.00
Third Year Students								
In-State tuition					$99,120.00	$37,170.00	$123,900.00	$49,560.00
Out-of-State tuition					$34,962.00	$17,481.00	$43,702.50	$17,481.00
Regional tuition					$59,444.00	$29,722.00	$74,305.00	$29,722.00
Mandatory fees					$21,864.00	$9,110.00	$27,330.00	$10,932.00
Fourth Year Students								
In-State tuition							$99,120.00	$37,170.00
Out-of-State tuition							$34,962.00	$17,481.00
Regional tuition							$59,444.00	$29,722.00
Mandatory fees							$21,864.00	$9,110.00
Total Tuition and Fees	**$210,842.40**	**$91,629.20**	**$484,630.20**	**$201,179.20**	**$833,136.00**	**$323,085.00**	**$1,275,127.50**	**$495,839.00**
GRANTS	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
CONTRACTS	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
OTHER (Specify)	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Total Grants, Contracts, Other	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**
TOTAL	**$210,842.40**	**$91,629.20**	**$484,630.20**	**$201,179.20**	**$833,136.00**	**$323,085.00**	**$1,275,127.50**	**$495,839.00**

NOTE: All of the above figures are estimates based on projections made by the institution submitting the proposal.

ACADEMIC PROGRAM BUDGET FORM

Use this form for programs that can be pursued on a full-time basis, part-time basis, or through a combination of full-time and part-time attendance.

EXPENDITURE ESTIMATES

	FY'18 - Year 1		Year 2		Year 3		Year 4	
PERSONNEL SERVICES	Additional resources required for program	Expenditures from current resources	Additional resources required for program	Expenditures from current resources	Additional resources required for program	Expenditures from current resources	Additional resources required for program	Expenditures from current resources
Administrators		$15,000.00		$15,000.00		$15,000.00		$15,000.00
Faculty	$130,000.00		$93,000.00	$130,000.00	$130,000.00	$223,000.00	$130,000.00	$353,000.00
Support Staff (Advising)		$8,000.00		$8,000.00		$8,000.00		$8,000.00
Others (TA)			$130,000.00		$65,000.00	$130,000.00	$65,000.00	$195,000.00
Fringe Benefits %								
Total Personnel	**$130,000.00**	**$23,000.00**	**$223,000.00**	**$153,000.00**	**$195,000.00**	**$376,000.00**	**$195,000.00**	**$571,000.00**
OPERATING EXPENSES								
Instructional Resources								
Other (specify)								
Total Operating Expenses	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**
CAPITAL								
Facilities								
Equipment								
Other								
Total Capital	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**
NET STUDENT ASSISTANCE								
Assistantships								
Fellowships								
Stipends/Scholarships	$63,252.72	$27,488.76	$145,389.06	$60,353.76	$249,940.80	$96,925.50	$382,538.25	$148,751.70
Total Student Assistance	**$63,252.72**	**$27,488.76**	**$145,389.06**	**$60,353.76**	**$249,940.80**	**$96,925.50**	**$382,538.25**	**$148,751.70**
TOTAL EXPENDITURES	**$193,252.72**	**$50,488.76**	**$368,389.06**	**$213,353.76**	**$444,940.80**	**$472,925.50**	**$577,538.25**	**$719,751.70**

NOTE: All of the above figures are estimates based on projections made by the institution submitting the proposal.

ACADEMIC PROGRAM BUDGET FORM

Use this form for programs that can be pursued on a full-time basis, part-time basis, or through a combination of full-time and part-time attendance.

	Year 1 FY18	Year 2 FY19	Year 3 FY20	Year 4 FY21
BUDGET SUMMARY OF COMBINED EXISTING AND NEW PROGRAM				
Total Revenue	$302,471.60	$685,809.40	$1,156,221.00	$1,770,966.50
Total Expenses	$243,741.48	$581,742.82	$917,866.30	$1,297,289.95
Excess/Defeciency	**$58,730.12**	**$104,066.58**	**$238,354.70**	**$473,676.55**
BUDGET SUMMARY OF EXISTING PROGRAM ONLY				
Total Revenue	$91,629.20	$201,179.20	$323,085.00	$495,839.00
Total Expenses	$50,488.76	$213,353.76	$472,925.50	$719,751.70
Excess/Defeciency	**$41,140.44**	**-$12,174.56**	**-$149,840.50**	**-$223,912.70**
BUDGET SUMMARY OF NEW PROGRAM ONLY				
Total of Newly Generated Revenue	$210,842.40	$484,630.20	$833,136.00	$1,275,127.50
Total of Additional Resources Required for	$193,252.72	$368,389.06	$444,940.80	$577,538.25
Excess/Deficiency	**$17,589.68**	**$116,241.14**	**$388,195.20**	**$697,589.25**

NOTE: All of the above figures are estimates based on projections made by the institution submitting the proposal.

Appendix C

Library Impact Statement

LIBRARY IMPACT STATEMENT (New Program Proposal)
LIBRARIAN'S ASSESSMENT

Subject selectors will complete this form as requested, assessing library materials and collections as detailed below. Send one copy of the assessment to the faculty member who requested it. Send one copy of the assessment to the Collection Management Officer.

Program: Data Science

Department, College: Data Science Program, Arts & Sciences and Business

Faculty Member: Prof. Joan Peckham

Date returned to Faculty: 2/16/17

Librarian Completing Assessment: Amanda Izenstark

Collection Management Officer: Joanna Burkhardt

Assessment of:

- Suitability of existing library resources;
- New library resources required to support the program;
- Information skills education required by the students; and
- Funds needed for library materials and services.

Please include:

1. What library holdings already exist in relevant subject categories? How much money is now allocated in the program subject area?

The University Libraries have a good core collection of computer science and statistics materials, and as interest in data science has grown over recent years, additional materials to support research in this area have been added to the collection. Overall, Computer Science and Statistics is currently allocated $4,500 per year for the purchase of monographs.

2. Does URI have the essential journals as noted in the Faculty Questionnaire?

No essential journals are noted, as many of the projects students will be undertaking will fall under disciplines that already have strong collections in print and online: Computer Science and Statistics, Business, Mathematics, Engineering, etc.

3. What new resources are required to support the program (including media, electronic, or other non-print materials)?

No new research resources are required to support the program. As has been the practice over past years, annual adjustment of the Libraries' collection in Safari Tech Books will take into account the new Data Science curriculum. Ideally, the University Libraries will purchase more books and an additional license to the Safari Tech Books collection in the future, based on usage.

4. What information mastery sessions will be required for the students?

As students will not be conducting library research for their projects, sessions based on databases and catalog holdings are less relevant. Consultations with and attendance at sessions run by the new Data Science Librarian will enhance student work, however.

5. What is the approximate cost to acquire the materials necessary? Which of these will be continuing costs?

There are *currently* no new costs to be incurred.

Should demand for ebooks related to data science grow, this may involve some additional costs. Based on quotes Prof. Andrée Rathemacher, Head of Acquisitions, received from URI's ProQuest representative in November 2016, adding 20 books to the current Safari Tech Books collection would cost an additional $737 per year, and adding an additional seat to the subscription would cost approximately $2,000 per year.

In the future, as the program evolves, it may be useful to subscribe to databases containing datasets, and purchase other standalone datasets. For the maximum benefit to the entire University community, establishing the University Libraries as the subscriber and point of access for these resources will streamline and facilitate access for researchers across disciplines. At this point, however, the University Libraries do not have funds for these purchases, and this will require additional funding from the University.

Rev 6/16/15 jmb